NAVAL WAR COLLEGE
Newport, R.I.

THE THIRD WORLD SUBMARINE THREAT - ANOTHER GREAT EQUALIZER?

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature:

22 November 1991

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY 2b. CLASSIFICATION / DOWNGRADING SCHEDULE	3 DISTRIBUTION / AVAILABILITY OF REPORT DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION OPERATIONS DEPARTMENT 6b. OFFICE SYMBOL (If applicable) C	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) NAVAL WAR COLLEGE NEWPORT, R.I. 02841	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

THE THIRD WORLD SUBMARINE THREAT - ANOTHER GREAT EQUALIZER? (U)

12. PERSONAL AUTHOR(S)
LAWTON, FRANK C. III, LCDR, SC, USN

13a. TYPE OF REPORT	13b TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
FINAL	FROM ____ TO ____	91/02/11	33

16. SUPPLEMENTARY NOTATION A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

17. COSATI CODES		
FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
Paper examines past, present, and future third world submarine capabilities

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

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20 DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL CHAIRMAN, OPERATIONS DEPARTMENT	22b TELEPHONE (Include Area Code) 841-3414 22c. OFFICE SYMBOL C

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE

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PREFACE

It is June 1997. The Soviet Union, citing repeated attacks by Afghanistan rebels re-occupies Afghanistan as a "peace-keeping" force. Although initially stating that its objective is to only protect the government and people of Afghanistan, that objective has now changed. In the U.N., the Soviet Union declares that use of Pakistan havens for the Afghanistan rebel forces is a threat to "international peace and security." The Soviets state that unless Pakistan ceases to harbor the rebels, it will be forced to take "all necessary actions" to prevent the use of Pakistan as a refuge for the rebels.

The United States reacts strongly and quickly to this implied threat of invasion of Pakistan. A U.S. Navy Battle Group operating in the South China Sea is ordered to proceed immediately to the Arabian Sea as a show of force off the coast of Pakistan.

At this point, India responds to the increased state of military readiness in Pakistan. Citing this as a threat to its security, and recalling the 1971 deployment of the USS ENTERPRISE (CVN-65) Battle Group to the Bay of Bengal during the Indo-Pakistan War, India takes actions of her own. She declares a 1200 NM outer defense zone for

surveillance by her May and Bear reconnaissance aircraft and a 700 NM inner defense zone[1] in which any extra-regional forces will be attacked. Included in the 1200 NM zone is the U.S. base at Diego Garcia and in the 700 NM zone all of the Arabian Sea and the western approach to the Malacca Straits (see Appendix I). At the approaches to the Malacca Straits, she sends three of her West German built Type IKL-1500 Air Independent Propulsion (AIP) diesel submarines equipped with both wire guided torpedoes and torpedo tube launched Exocet cruise missiles. More ominous, she deploys her two new Soviet built, nuclear powered Oscar class submarines armed with SS-N-19 long range cruise missiles, along with six Soviet Kilo class diesel submarines to deploy in a barrier stretching from the Maldive Islands to Masirah Island off the coast of Oman.

Protests by the United States in the U.N. regarding Freedom of Navigation restrictions are unsuccessful in getting India to change her mind. The United States considers its next move . . .

THE THIRD WORLD SUBMARINE THREAT - ANOTHER GREAT EQUALIZER?

CHAPTER I

INTRODUCTION

Over the past 30 years much has been made of restricting the access of nuclear weapons to the "nuclear club" consisting of the United States, the Soviet Union, Great Britain, France, and China. The spread of nuclear weapons has been viewed by the members of this club as a potentially destablizing influence on world peace. Nuclear weapons in the hands of a third world country can be a political and military equalizer when dealing with both regional and superpowers. Despite these concerns, and the existence of a nonproliferation treaty, it is generally recognized that many third world countries have acquired such weapons or are attempting to.

The purpose of this paper is to examine another potential "equalizer" in the hands of third world - the submarine. The power of the submarine in the history of 20th century naval warfare is well known, particularly as to the damage it can inflict on merchant shipping. One of the primary focuses of both the United States Navy and the Soviet Navy is submarine warfare. While the two superpowers

have been focused on this threat as potential adversaries, in "real world" late 20th century warfare, neither has had to worry too much about it. The Korean and Vietnam wars, various short police actions (Grenada, Panama) and now the Iraqi war in the mid-east were (are) fought without a submarine threat to sea control or power projection. The one exception is the 1982 Falklands War which is included in the scope of this paper. While only time will bear this out, a Falklands scenario may be just as likely in the future as is a Desert Storm scenario. If that turns out to be the case, then the United States Navy needs to examine exercising sea control and power projection in a hostile submarine environment that has some differences from the Soviet submarine threat.

This paper is organized into three parts. The first is a historical review of the impact of submarines on sea control and power projection. Next, the third world threat is examined from the standpoint of platforms, weapons, capabilities, etc. Lastly, methods to neutralize this threat are discussed.

CHAPTER II

HISTORICAL OVERVIEW

Although the submarine threat is well understood, a brief examination of that threat as it has appeared from an operational level of war is worthwhile.

COMCRUDIV FIVE Marshall Islands Raid. The first account involved Rear Admiral Raymond A. Spruance in the early days of World War II. Spruance was, at the time, the Commander of Cruiser Division Five as part of Rear Admiral Halsey's Carrier Task Force. In February 1942, as a part of Admiral Nimitz's plan to strike back at the Japanese after Pearl Harbor, Spruance's heavy cruisers participated in an air and surface raid on the Japanese held Marshall Islands. Early in the attack on one of the islands, Wotje:

> . . . NORTHHAMPTON (Spruance's flagship) reported a periscope on the port beam. Spruance didn't want to believe it. He had considered the possibility of submarines at Wotje, decided there would be none, and had dismissed the submarine threat from his mind. He reluctantly ordered a cease fire and reversed course in an emergency turn. When the cruisers had steadied up, he ordered them to resume fire. But their accuracy was temporarily impaired; and radical change of course or speed disrupted the gunnery fire control solution.
>
> The raid became a deadly game of hide-and-seek . . . after 45 minutes of firing, the cruisers had sunk few, if any, of the evasive merchantmen . . . Japanese shore batteries had unlimbered . . . and the submarine scare would

> not abate. Zacharias in SALT LAKE CITY had been sure, before the raid, that Japanese submarines would defend Wotje. Fictitious submarine sightings confirmed his fears: a scout plane reported two submarines leaving the lagoon; a surface ship inside resembled a submarine tender; empty, bobbing gunpowder cases that had been thrown overboard were identified as periscopes by jumpy lookouts. Almost everyone except Spruance was soon convinced that submarines had surrounded the American ships. The cruisers twisted and turned to avoid torpedoes that their captains believed were streaking toward them. Spruance signaled his cruisers to disregard the "periscope" sightings to no avail. Tactical discipline had broken, the guns could no longer fire, and Spruance watched helplessly as his panicked cruisers fled from imaginary submarines.[2]

Later in the raid, Spruance would restore tactical discipline to his force. Although he viewed the raid as worthwhile, he was upset with himself over his certainty that there never had been a submarine threat to begin with.

While this raid was a minor engagement, it points out the effect that a submarine threat (real or imagined) can have on a force that may not be prepared for it. As Admiral McKee, Director of Naval Nuclear Propulsion Programs, has said, "A submarine in the ocean scares the hell out of people."[3]

The Falklands War. Moving on to a more recent conflict, the 1982 Falklands War provided more insight on the effect submarines can have on surface forces attempting to establish sea control and project power. In that

conflict, both sides had to deal with a submarine threat to their forces.

The most well known submarine warfare event of this war was the sinking of the Argentina cruiser GENERAL BELGRANO. Escorted by two Argentina ASW frigates, the BELGRANO was sunk by the British nuclear powered attack submarine HMS CONQUEROR in the early stages of the war. The result of this action was the removal of the entire Argentina surface fleet from the theatre of operations. The Argentina point of view was that "all the years of UNITAS ASW exercises with the USN and other Latin American navies had been for naught as the SSN succeeding in eluding them and sinking one of their ships."[4]

That the Royal Navy, with its excellent submarine force, had been able to sink an Argentina surface combatant is not surprising. The outcome had the desired effect - sea control - at least sea control of the surface of the sea.

The more interesting submarine warfare engagement, as it relates to the third world threat, occurred on the part of the small Argentina diesel submarine force. Although only one Argentina submarine, a small West German built Type 209 diesel, operated against the British task force, she caused a great deal of concern in the task force. This

submarine, the SAN LUIS, with a new and inexperienced crew, faced two British VSTOL/ASW carriers, 15 frigates and destroyers with ASW aircraft, and several British submarines. During a six week patrol, she traveled 800 NM from her base, and generated three torpedo attacks. Two of these attacks were against British warships and were made with a sonar (vice periscope) approach. Although torpedoes were launched, both attacks were unsuccessful due to equipment malfunctions after launching.[5] One of these attacks was against one of the Royal Navy's VSTOL carriers, whose helos and escorts subjected the SAN LUIS to a 20 hour counterattack, which she survived. Through a combination of luck and a "classify with ordnance" ASW approach to all unresolved contacts, the British successfully defended their valuable task force.[6] Had Argentina succeeded in attacking and sinking or damaging a high value target such as the VSTOL carrier HMS INVINCIBLE or one of the ocean liners used as troop ships, the outcome of the war may have been different.

CHAPTER III

THE THIRD WORLD SUBMARINE THREAT

Order of Battle. Apart from the U.S. and Soviet navies, there are now 41 countries with more than 400 diesel submarines.[7] Of these 400 submarines, 250 are in the third world.[8] Twenty years ago there were only 45 diesel submarines in the third world. A listing of all submarines by country is provided in Appendix II.[9] A review of this Appendix shows a wide variety of submarine types. Many countries (Cuba, Syria, Libya, North Korea) have older Soviet 1950's vintage diesel submarines (the Foxtrot, Romeo, and Whiskey class boats), while others have the latest Soviet Kilo class diesels (India, Algeria) and/or West German Type 209 diesels (India, Indonesia). Also of interest, countries such as Iran are listed as having "plans" for submarines.[10] As a historical note, Iran had six West German Type 209s on order, along with three TANG class diesels due for transfer from the U.S. shortly before the fall of the Shah.[11] The TANG class boats were training in Groton, Connecticut with Iranian crews already on board.[12] Needless to say, the West's ability to maintain the flow of oil out of the Persian Gulf and to protect friendly Arab nations during the Iran-Iraq

War would have been quite a bit more challenging had these submarines been delivered.

Capabilities. Lenin said "quantity has a quality of its own."[13] The quantity of diesel submarines certainly exists, but what is the quality of these submarines? Properly maintained and operated, they are very capable, particularly in a barrier defensive role where their limited underwater speed and endurance are not required. Extremely quite when operating on their battery, they make detection using passive sonar very difficult. Newer classes may have anechoic hull coatings to absorb, rather than reflect active sonar.[14] Along with torpedoes (some of which are wire guided), most, it can be assumed, have a covert mining capability.[15] As an example of the destructive capability of a torpedo, Soviet export weapons carry a 400 kilogram warhead. The 14,000 ton BELGRANO was sunk with two 340 kilogram warhead torpedoes. The USS SAMUEL B. ROBERTS was nearly broken in half by one 125 kilogram mine.[16] Finally, some third world submarines may soon have a tube launched anti-ship missile capability.[17]

An example of a modern diesel submarine is the West German TR1700 diesel boat sold to Argentina after the Falklands War. Compared to the Type 209 boats used by Argentina in that war, these boats carry 10 more torpedo

reloads, have a larger battery and battery charging capacity to reduce the time spent snorkeling to charge batteries, and have a 70 day vice 30 day endurance. The maximum submerged speed on the battery is 25 knots for one and one-half hours.[18] Another example of a modern diesel submarine is the Royal Netherlands Navy's Walrus class. To reduce manning levels, they have fully automated engineering spaces and consequently a crew of less than 50, a crush depth greater than a LOS ANGELES class nuclear attack submarine, and during the NATO North Star exercise, a Walrus class was the only "orange" submarine (nuclear or diesel) to "sink" a "blue" aircraft carrier.[19]

Overall, third world countries have recognized that submarines can have an impact out of proportion to their cost.[20] An often quoted statistic from the Second World War is that U.S. submarines, employing 1.6 percent of the Navy's manpower, sank 54 percent of Japan's shipping.[21] The area of cost and effectiveness in maintaining a complex submarine has seen improvement in the last decade. Without proper maintenance and training, no number of submarines will be a threat. The Indonesians, in the early 1960's obtained a whole squadron of Soviet Whiskey class submarines and a depot repair ship. They eventually proved to be unsuccessful from a maintenance and operational

standpoint and were disposed of.[22] The Soviet Charlie I class nuclear submarine leased by India was nicknamed the "Chernobyl class" and had propulsion problems that kept it alongside its pier for much of the lease period.[23] These problems may be a thing of the past, at least when dealing with Western built submarines. For example, the French built diesel submarines sold to the Pakistan Navy included after sales support for parts, technical support, and training for the life of the submarine.[24] Swedish and German firms offer the same type of after sales support. This reliance may be a weakness if and when foreign technicians depart and the third world country can no longer maintain their force of submarines. On the other hand, a small number of countries (North Korea, India, Argentina) have demonstrated the ability to build their own diesel submarines (with some help from the parent company), thus demonstrating the skills required to produce and maintain a submarine.

The Coming High Tech Revolution. The diesel submarine has two widely recognized weaknesses, lack of mobility (speed), and noise generated while snorkeling to recharge its batteries. The mobility weakness centers around its inability to transit at high speeds. To travel medium to long distances requires it to snorkel at a shallow depth

(approximately 50 feet) while using its noisy diesel engine for propulsion. While snorkeling, it is speed limited by its masts, antennas, and periscopes to less than 20 knots, and is very vulnerable to attack. It can go deep and increase speed by using its batteries, but its endurance at medium to high speed on the battery is measured in hours. It is this inability to travel long distances, at speed, covertly, that is one of the advantages of nuclear propulsion to "blue water" navies like the United States Navy. For a third world submarine, intent in defending a coastline, strait, etc., close to home, this mobility weakness is greatly reduced.

The snorkeling noise is one weakness that the third world submarine cannot escape. Sooner or later, even close to home and at slow speed, the submarine must come near the surface to snorkel to recharge its batteries. This may change, however. The frequency of and time spent snorkeling may soon be signicantly reduced with the advent of Air Independent Propulsion (AIP).

Late in the Second World War, the Germans were developing a submarine that could run producing its own oxygen from hydrogen peroxide. The British, in the late 1940s, put into service two submarines using this technology (one named the EXPLORER, was called the EXPLODER

by its crew after a series of mishaps). The technology was not entirely successful, and the advent, in the 1950s, of a small nuclear reactor that could be put into a submarine, put an end to this program.

Air Independent Propulsion (AIP) for diesel submarines is a revival of the quest to reduce the diesel submarine's dependence on snorkeling to recharge its batteries. Without getting into all the technological aspects of the different types of AIP, basically AIP means that the diesel submarine has the means to operate at slow speeds (up to 8 knots) with a fully charged battery for periods of two weeks or more without coming shallow to snorkel. The air independence is produced either by stored oxygen, stored reactants, or by a low power nuclear battery charger.[25] The Dutch are working on a closed cycle diesel engine, the Germans a fuel cell power plant, the Swedes a Sterling external combustion engine, and the Canadians a low power nuclear reactor.

How does this affect third world countries and the balance of power at sea? An examination of the Swedish effort in the quiet, external combustion Sterling engine provides some insight. In August 1990, the Swedes completed a year long test of the Sterling engine in the 1,030 ton diesel submarine, NACKEN. The results of that test were the following:[26]

- Submerged patrol time without snorkeling was increased by a factor of 3 to 5.

- A 1,000 hour running time goal was achieved with the Sterling engine.

- On the average, NACKEN operated two weeks without snorkeling compared to the normal five to seven days.

- During a 20 day patrol, the percentage of time spent snorkeling at periscope depth (50 feet) with snorkel mast raised was reduced from 11% (72 hours) to 0%.

The navies of the third world may soon have access to this technology. The president of Kockum Shipyard, where this test was conducted, stated that Sterling engine systems will be sold to several foreign navies. Along with its operational advantages, the Sterling engine has the additional advantages of relatively low cost ($20 million) and the ability to be backfitted into existing submarines (as was done in the case of the NACKEN).[27]

The bottom line of AIP is that it may significantly increase the capabilities of third world navies. By reducing the frequency and time spent near the surface snorkeling, the diesel submarine's vulnerability to detection during patrols will be reduced. It is for this reason that AIP has been called the poor man's version of the nuclear submarine.[28]

CHAPTER IV

NEUTRALIZING THE THREAT

The capabilities, both present and future, of the third world navies in submarine warfare have been discussed. Methods to neutralize that threat from the strategic, operational, and tactical levels will be examined next.

The Proliferation Issue. One of the points that may have already become obvious is that we (meaning both Western and Communist Bloc nations) may be our own worst enemy when it comes to technology transfer and war fighting capabilities in submarine warfare. This is nothing new in the arming of nations. It doesn't necessarily mean it is smart, however. The transfer of a Surface to Air Missile system, or a frigate, helo, or fighter plane to a third world country is different than the transfer of a submarine. Why? There are two reasons. First, the West has been very successful in developing technology and tactics to defeat or minimize the effect of certain third world naval threats. Our Anti-Air Warfare (AAW), Anti-Surface Warfare (ASUW), and Strike Warfare capabilities are excellent and have been tested successfully in hostile environments. The same cannot be

said for our Anti-Submarine Warfare (ASW) capabilities. As learned during fleet ASW exercises and the Falklands War, submarines are hard to find and can have devastating effects on surface ships when they attack.

The second reason for their difference from other weapons systems (and the reason third world navies want them) is that submarines can be a great force multiplier for a third world country if properly used. Few third world countries could ever hope to match the U.S. in aircraft, ships, missiles, etc. and effectively use those weapons to achieve political or military objectives. A small force of submarines, however, can potentially extract a cost (political or military) out of all proportion to their size.

Does all this mean we should have a nonproliferation treaty and/or arms control for diesel submarines? No, mostly because it won't work, just as it didn't work to halt the spread of nuclear weapons. What it does mean, particularly with the potential of AIP, is that countries such as Germany, Sweden, etc. should now consider it in their economic, political, and military interest to slow the spread of destabilizing technology to third world countries. This can't completely solve the problem of proliferation, particularly if the Soviets step into the

void created by the withholding of Western technology from the world marketplace. It will, however, make it harder and perhaps more expensive (in both a monetary and political sense) for countries to obtain the technology. Such costs are causing India to now re-evaluate her nuclear (but not diesel) submarine program.

A Flexible Response Strategy Applied to Submarine Warfare. One of NATO's well known competitive strategies with the Warsaw Pact was (and is) a flexible response to an attack. A massive Warsaw Pact conventional attack that threatened to overrun Western Europe could be met by escalating to theater nuclear war. This competitive strategy, theoretically, acted as a deterrent to an attack on NATO.

Due to the escalating nature of submarine warfare by a third world navy, it may be possible to use a form of flexible response as a competitive strategy to neutralize this threat. An example would be a Freedom of Navigation operation where a third world country has suddenly expanded its territorial seas to include some strategic strait. To back up its claim, it threatens to sink, using its submarines, any ships that enter its new territorial waters. Under a flexible response strategy, the U.S. response could be to state that commencement of submarine

warfare would be met with a measured but equally damaging response to the third world country, preferably one they have little or no capability to counter. For example, the country's world wide merchant shipping could be held at risk of attack by U.S. submarines.

Such a competitive strategy will not work in every situation, but may be effective in countering the threat without any loss of "national treasure."

Intelligence. The capabilities of the third world navies vary widely. In the next decade, some will develop into valid threats, while others will not. Presently, a significant intelligence effort is directed by the U.S. against Soviet submarines and vice versa. As the threat in the third world increases, there needs to be the same type of efforts focused on the third world. Expansion of the Sound Surveillance System (SOSUS) and other detection systems to include sea areas around potential third world threats should be pursued. Information on tactics, operational availability, weapons employment, etc. can all help reduce or neutralize the threat. Intelligence gathered on Lybia's submarines during the El Dorado Canyon operation assisted the Battle Group Commander's evaluation of the enemy's capabilities and intentions.

Anti-Submarine Warfare (ASW) for the Third World.

Anti-Submarine Warfare is the biggest war fighting challenge the U.S. Navy faces. In 1989, the Chief of Naval Operations, Admiral C. A. H. Trost, announced that ASW was his top war fighting priority as the CNO.[29] About the same time, the Assistant Secretary of the Navy for Research, Engineering, and Systems alluded to a crisis in ASW that could "undermine our ability to execute the U.S. maritime strategy."[30] A senior Royal Navy officer with experience in diesel submarines commented on ASW technology, stating that "All they say about ASW technology is absolutely true. It all works - in a controlled environment. We have had spectacular success hiding from ASW assets."[31] Anyone familiar with "fleet ASW" can relate to some of these "spectacular successes" on the part of submarines. A key issue here may be to keep the submarine "hiding".

How does the third world submarine threat make the ASW problem more challenging? First, at present the submarines are all diesel/electric propelled. As discussed earlier, this means when they are not snorkeling, i.e., operating on the battery, they are very difficult to detect using passive sonar. Their small size, relative to a nuclear submarine, may make them more difficult to detect using active sonar. They will operate in familiar waters and may

hide in or close to shallow waters using their continental shelf as an acoustic "screen." After the SAN LUIS attack on the the British during the Falklands War, she snorkeled in tidal waters off the island of Puerto Argentino, making her very difficult to detect.[32]

That the Battle Group Commander will be faced with a challenge is clear. What can he do, given that some of the traditional aspects of area, task force, and barrier ASW may be less effective? Finding a diesel submarine for a hard kill could be difficult to impossible except on a "flaming datum" or perhaps by catching the submarine snorkeling. A soft kill approach my be an answer. There are different ways to achieve a soft kill. One method is to scare the submarine by filling the water (in a strategic strait, or an amphibious objective area for example) with ordnance. This would be no place for a friendly or neutral submarine to be, however. At best, friendly submarines could be placed in spots that the enemy submarines would likely flush to in order to hide from the the ordnance "barrage." This fill the water with ordnance tactic was used by the British during the Falklands War where they "classified with ordnance" any unresolved contacts. It may have worked. The SAN LUIS' attack approach on the British ships was made using sonar only. Staying deep and not

using her other attack sensor (her periscope) may have been a result of the intensity of British ASW tactics and could have impacted her target solution. The disadvantage of the classify with ordnance approach is obvious - the availability of ordnance, specifically MK 46 torpedoes at a cost of $250,000 each. This brings up another question. How effective is an ASW torpedo in shallow water? Admiral Sir Ben Bathurst, NATO Commander in Chief Channel (CINCHAN) discussed the requirement that ASW weapons function effectively in both deep and shallow waters. Specifically, he stated that "The shallow water environment abounds in false contacts, giving use to greater weapons expenditure. We must have an inexpensive ASW weapon."[33] To this end CINCHAN had the Belgian Navy retain its four frigates equipped with 375mm ASW rocket launchers. The Norwegians developed a similar rapid fire ASW rocket system for use in the fjords.[34] The U.S. Navy will have to expand it ordnance types and endurance loads to effectively use this tactic.

A second soft kill ASW tactic would be to confuse the submarine. That can be done (as it is in the air) with decoys, jamming (acoustic), or masking. All of these tactics force the submarine to come shallow to verify its target, thereby making it more vulnerable to attack and

limiting the area he can control to that which he can see from his periscope, i.e., a few miles. Decoys have the additional advantage of increasing the ratio of targets (real and decoy) to submarines, thereby reducing the time available to attack real targets.[35] A small third world diesel submarine force could quickly find itself overwhelmed by attempting to sort out real targets from decoys.

The U.S. Navy's ability to preform soft kill varies. The ability to mask the noise made by a surface ship from a submarine exists now in the form of the Prairie-Masker system installed in certain surface ships.[36] The decoy and acoustic jamming capabilities are more limited. The technology, however, to improve that capability exists now and could be backfitted to existing platforms with minimal cost and effort.[37]

None of this is to suggest that current ASW doctrine be disregarded in favor of soft kill only. To a certain extent, soft kill tactics are practiced now as a part of ASW exercises. The third world submarine threat does suggest, however, that in fighting a force that may be almost impossible to detect, for the reasons already discussed, soft kill needs additional emphasis. It may also have the added advantage of meeting the quiet Soviet submarine threat of the next century. To quote again

Admiral McKee, "we will eventually get to the point where airplanes and submarines are going to have a hell of a time finding other submarines except in the act of perpetrating some sort of violence."[38] If that is the case, then fear and confusion on the part of the submarine from soft kill tactics will be much more important to the Battle Group Commander than the hard kill "find and sink" approach.

CHAPTER V

CONCLUSION

If the conflicts the U.S. Navy has found itself in since World War II (Korea, Vietnam, Grenada, Libya, Persian Gulf) are an indication of the future, then the submarine threat in the future may be nonexistent. If, however, the Falklands War was not a one time aberration, then the U.S. Navy, often referred to as the President's "force of choice," faces challenges it has not faced before. It can be assumed that the Navy will continue to be called upon to operate in close proximity to third world shores in Naval Gunfire Support (NGFS), Freedom of Navigation (FON), personnel evacuation, and amphibious operations. It can also assumed that the traditional show of force deterrence mission will be required in the future.

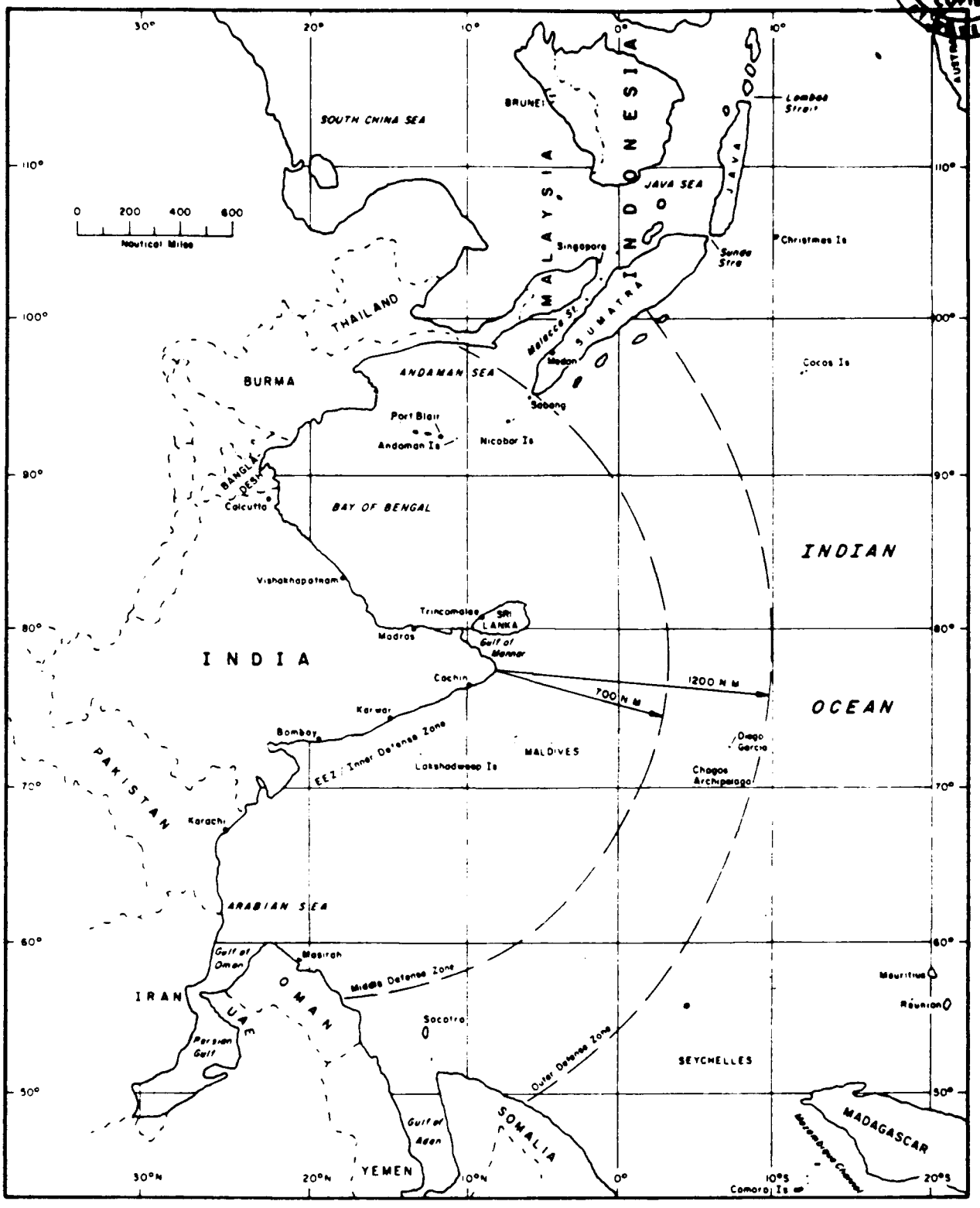
A hostile submarine in these operating areas could result in at least four possible outcomes. The first (and most desirable) is successful execution of the mission through the neutralization of the submarine threat by any of the means discussed earlier. The second is successful execution of this mission but with loss of lives and ships to submarines in the course of executing the mission. The third is failure to execute the mission due to the loss of

lives and ships, i.e., the costs outweigh the benefits after the mission has begun. The last outcome is a decision to not execute the mission in the first place due to early recognition of a poor cost/benefit ratio. It is this last outcome that the third world country is going to want to achieve. It is also the one with the most potential impact on United States policy.

Another lesson of the Falklands War and the Persian Gulf tanker wars is that naval warfare remains a very deadly business for the West, even when facing a third world country. It has been said that in the business of international naval transfers, the 1970s and early 1980s could be labeled the decade of the small missile boat and that the late 1980s and 1990s may be remembered for the rapid and global proliferation of the submarine.[39] It appears that the use of submarines in the third world is at a crossroads. Looming on the horizon are Air Independent Propulsion submarines and possibly nuclear powered guided missile submarines. Many of the third world's submarines are 20 to 30 years old and, therefore, must be replaced in the next 10 years. The performance of third world navies (for example Iran, Iraq, Libya) using missile equipped gunboats and frigates has generally been poor. Third world air force performance (again Iran, Iraq and Libya) has not

been much better - with the notable exception of the Falklands War, where the British lack of AAW defenses cost them several ships. Third world surface and air forces simply cannot survive against the U.S. Navy's ASUW and AAW capabilities. That leaves the submarine as the last alternative for the third world navy.

If the western Europeans and/or the Soviet Union re-equip these countries with new, more capable submarines, then the threat will be real. It will require both United States policy along with Navy strategy and operations to change to meet the threat. Failure to do so will be costly to both the country and the Navy.



APPENDIX I

The World's Submarines

COUNTRY	NUMBER and TYPE of VESSEL
Albania	2 *Whiskey*-class
Algeria	2 *Romeo*-class
	2 *Kilo*-class
Argentina	2 *Type 209*
	2 (in service) + 3 (building) + 1 (projected) 'TR1700'-class
Australia	6 *Oberon*-class
	6 (building) + 2 (projected) *Type 471*
Brazil	3 ex-US *Guppy*-class
	3 *Oberon*-class
	1 (in service) + 2 (building) + 1 (projected) *Type 209*
	Plans for nuclear propulsion in a later class
Bulgaria	4 *Romeo*-class
Canada	3 *Oberon*-class
China (PRC)	1 (in service) + 3 (building) *Xia*-class SSBNs
	2 (in service) + 2 (building) *Han*-class SSNs
	1 *Golf*-class
	3 *Ming*-class
	1 *Modified Romeo*-class
	84 *Romeo*-class
China (ROC	2 *Modified Zwaardvis*-class
	2 *Guppy*
	1 14-ton midget
Chile	4 *Type 209*
	2 *Oberon*-class
Cuba	3 *Foxtrot*-class
Denmark	3 *Type 207*
	2 *Nahrvalen*-class
	2 *Delfinen*-class
Ecuador	2 *Type 209*
Egypt	10 *Romeo*-class (4 ex-PRC, 6 ex-USSR)
	2 *Whiskey*-class
	2 *Oberon*-class (purchased 1989)
France	6 (in service) + 1 (building) SSBNs
	4 (in service) + 3 (Building) + 1 (projected) *Rubis*-class SSNs
	4 *Agosta*-class
	9 *Daphne*-class
	1 *Narval*-class
Germany (FRG)	18 *Type 206* and *Type 206A*
	6 *Type 205*
Greece	3 *Guppy*-class
	8 *Type 209*
India	1 *Charlie I*-class SSGN
	6 *Kilo*-class
	2 (in service) + 2 (building) *Type 209*
	8 *Foxtrot*-class
Indonesia	2 *Type 209*
Iran	1 midget submarine; plans for a class of larger submarines
Israel	3 *T-540*-class
Italy	2 (in service) + 2 (building) *Improved Sauro*-class
	4 *Sauro*-class
	2 *Toti*-class
Japan	3 (building) *Improved Yuushio*-class
	10 *Yuushio*-class
	5 *Uzushio*-class
Korea (DPRK)	17 *Romeo*-class
	4 *Whiskey*-class
	20 small submarines
Korea (ROK)	3 KSS-1 *Tolgoras*-class small submarines
Libya	6 *Foxtrot*-class
	6 *Mala*-class two-man craft
Malaysia	Plans for submarine branch, no firm type decision
Netherlands	1 (in service) + 3 (building) *Walrus*-class
	2 *Zwaardvis*-class
	3 *Potvis/Zeehond*-class
Nigeria	Plans for a submarine branch
Norway	1 (in service) + 5 (building) *Ula*-class
	10 *Kobben*-class
Pakistan	2 *Agosta*-class
	4 *Daphne*-class
	Up to 9 *Cosmos* midgets
Peru	6 *Type 209*
	4 *Abtao*-class
Poland	1 *Kilo*-class
	1 *Foxtrot*-class
Portugal	3 *Daphne*-class
Romania	1 *Kilo*-class
Saudi Arabia	Plans for 6-8 submarines
South Africa	3 *Daphne*-class
Spain	4 *Agosta*-class
	4 *Daphne*-class
Sweden	4 *Västergötland*-class
	4 *Näcken*-class
	5 *Sjoormen*-class
	4 *Draken*-class (reserve)
Syria	3 *Romeo*-class
Thailand	Plans for a submarine branch
Turkey	6 (in service) + 6 (building) *Type 209*
	2 *Tang*-class
	7 *Guppy*-class
USSR	63 (9 in service) + 3 (building) SSBNs
	13 SSBs
	52 (in service) + 1 (building) SSGNs
	85 (in service) + 3 (building) SSNs
	16 SSGs
	120 (in service) + 2 (building) SSs (70 reserve)
	15 AGSS
	13 converting
United Kingdom	4 (in service) + 2 (building) + 2 (projected) SSBNs
	16 (in service) + 2 (building) SSNs
	12 (in service) + 3 (building) + 5 (projected) SS
United States of America	36 (in service) + 6 (building) + 2 (projected) SSBNs
	97 (in service) + 19 (building) + 7 (projected) SSNs
	3 SS
Venezuela	2 *Type 209*
Yugoslavia	2 *Sava*-class
	3 *Heroy*-class
	4 88-ton midgets
	4 *Mala*-class two-man

Note: The totals of those in service must be treated with caution as they do not represent the total availability. In the better found navies, operational availability is about 50 percent. In others it may be considerably less; eg of the 84 Chinese *Romeos* about 50 are in various states of reserve with less than half the remainder fit for operations.

NOTES

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